U1 L5 Quiz Review Guide: Analyzing Graphs of Functions (1.5)

Name: _____ HR: _____

Skills: Vertical Line Test, zeros, increasing/decreasing intervals and relative extrema, average rate of change and slope, and even/odd functions.

Vertical Line Test & Zeros: A graph represents a function if no vertical line crosses it more than once.





Zeros: set f(x) = 0 and solve. Zeros are the x-intercepts.

Ex: $f(x) = x^2 + x - 12$

$(x-3)(x+4)$

$x = 3, \; x = -4$

Fractions: set the numerator = 0 and solve. Remove those solutions ~~from the~~ Not in domain.

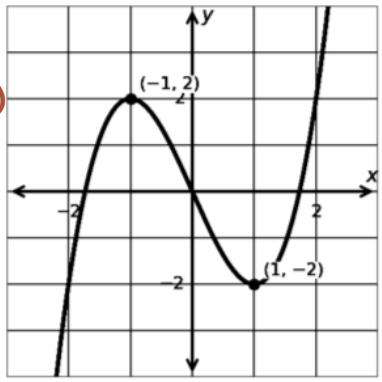
Ex: $f(x) = \frac{(x-3)(x+4)}{(x-3)(x-2)} = 0$ $x \neq 3$, $x = -4$ $D = \mathbb{R}, \; x \neq 3, 2$

Radicals: set Radicand ≥ 0 and solve. Solution is domain.

$f(x) = \sqrt{3x-1}$; $3x - 1 \geq 0$ $x \geq 1/3$ Domain

Increasing, Decreasing & Relative Extrema

Ex: $f(x) = x^3 - 3x$



Increasing: $(-\infty, -1) \cup (1, \infty)$

Decreasing: $(-1, 1)$

Rel. max of 2 at x = -1

Rel. min of -2 at x = 1

Linear Functions: Constant Rate of Change

For a linear function, the rate of change is the slope. It is the same between ANY two points.

Ex: f is linear, f(2) = 7 and f(6) = −5. Find the rate of change.

$A.R.o.C. = m = \frac{-5-7}{6-2} = \frac{-12}{4} = -3$

f decreases 3 units for every 1 -unit(s) increase in x.

Average Rate of Change

The slope of the secant line through two points: $\frac{f(x_2) - f(x_1)}{x_2 - x_1}$

Ex: $f(x) = x^2 + 3x$ from $x_1 = 1$ to $x_2 = 4$

$f(1) = (1)^2 + 3(1) = 4$

$f(4) = (4)^2 + 3(4) = 16 + 12 = 28$

$A.R.o.C = \frac{28-4}{4-1} = \frac{24}{3} = 8$

Even, Odd, or Neither?

Find f(−x) and simplify. Even: f(−x) = f(x), symmetric about the y-axis. Odd: f(−x) = −f(x), symmetric about the origin.

Ex: $f(x) = x^4 - 3x^2$

$f(-x) = (-x)^4 - 3(-x)^2 = x^4 - 3x^2$

$f(-x) = f(x) \Rightarrow$ Even

Ex: $g(x) = x^3 + 2x$

$g(-x) = (-x)^3 + 2(-x) = -x^3 - 2x$

$-g(x) = -x^3 - 2x$

$g(-x) = -g(x) \Rightarrow$ ODD

Ex: $h(x) = x^2 + x$

$h(-x) = (-x)^2 + (-x) = x^2 - x$

$h(-x) \neq h(x)$

$h(-x) \neq -h(x)$

} Neither

Rate of Change in Context

Units are always (output units) per (input unit).

Ex: A ball's height in feet after t seconds is $h(t) = -16t^2 + 64t + 4$. Find the average rate of change from t = 0 to t = 1.

$h(0) = 4$

$h(1) = -16(1)^2 + 64(1) + 4 = -16 + 64 + 4 = 48 + 4 = 56$ ft/sec

$\frac{\Delta y}{\Delta x} = \frac{\text{feet}}{\text{sec}}$

On average, how fast does the ball go up each second?

up 56 ft each second

Can You…?

☐ Use the Vertical Line Test?

☐ Find zeros algebraically and check them on a graph?

☐ Find the rate of change (slope) of a linear function?

☐ State increasing/decreasing intervals and relative extrema?

☐ Find and interpret an average rate of change?

☐ Decide algebraically if a function is even, odd, or neither?